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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/681,374	03/27/2001	Xiao-Dong Sun	RD-27727	3259

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EXAMINER
MACCHIAROLO, PETER J

ART UNIT	PAPER NUMBER
2875	

DATE MAILED: 10/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/681,374	SUN ET AL.	
	Examiner	Art Unit	
	Peter J Macchiarolo	2875	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondenc addr ss --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-38 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1,3,4,6,12,14,15,17 and 23-25 is/are rejected.

7)☒ Claim(s) 2,5,7-11,13,16 and 18-22 is/are objected to.

8)☒ Claim(s) 26-38 are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C.121:

   I. Claims 1-25, drawn to a gas discharge device, classified in class 313, subclass 491.

   II. Claims 26-38, drawn to a method for manufacturing a gas discharge device, classified in class 445, subclass 24.

The inventions are distinct, each from the other because of the following reasons:

Inventions of Group I and Group II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05 (f)). In the instant case the product as claimed can be made by a different process such as chemical vapor deposition.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Toan Vo on September 12, 2002, a provisional election was made with traverse to prosecute the invention of a gas discharge device according to claims 1-25. Affirmation of this election must be made by applicant in replying to this Office action. Claims 26-38 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

2. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on June 25, 2001 have been disapproved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance. The y-axis units should read --(lpw)-- to indicate lumens per watt.

Claim Objections

3. Claims 2, 5, 13, and 16 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

In regards to claims 2 and 13, it is well known in the art that an oxygen-containing compound of alkali-earth metal is synonymous with an alkali-earth metal oxide. Claims 5 and 16 are also objected to because they point to objected claims 2 and 13 respectively.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949).

In the present instance, claims 4, 6, 15, and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for reciting a broad recitation followed by a narrower statement of the range/limitation.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 3, 12, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zettl et al. (USPN 6,057,637) in view of Hsu et al. (USPN 6,333,598).

In regards to claim 1, Zettl teaches a composition for electron emitters comprising a mixture of carbon nanotubes and a binder material is desirable and produces reliable electron currents. Zettl further teaches that carbon nanotubes have very useful structural and electronic properties.

Zettl further teaches in column 5, lines 44-55 the binder can comprise of a number of compounds and materials, but is silent to the exact composition of the binder.

However, Hsu teaches in column 7 lines 34-43 that an electron emitter may be modified to include any low work function material, such as alkali metals and their alloys or compounds containing such materials. Hsu further teaches in column 6 lines 12-30, that an additional layer, including oxides, is desirable to form, in order to protect the nanotube emitters.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to formulate a composition for electron emitters of a gas discharge device comprising a mixture of carbon nanotubes and oxygen-containing compounds of alkali-earth metals. It would be relatively easy and cost effective to manufacture an electron emitter with an alkali-earth metal oxide deposited on the nanotubes. One would be motivated to carry out this deposition in light of Hsu because it can be seen that this coating will improve the filed emission efficiency while simultaneously protecting the nanotubes.

In regards to claim 3, Zettl in view of Hsu teach all of the recited limitations of claim 1 (above).

Hsu further teaches in column 10 lines 39-64, that the nanotubes have diameters from just a few to up to about tens of nanometers. Hsu further indicates these particular sized nanotubes have shown very promising field emission characteristics.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to formulate a composition for electron emitters of gas discharge device according to claim 1 (above), wherein the carbon nanotubes have a diameter in a range from about 1nm to about 200nm.

In regards to claim 12, Zettl teaches an electron emitter material, which is to be used in a gas discharge device, that comprises an electrically conductive material, coated with a mixture of nanotubes and a binder material. Zettl further teaches these carbon nanotubes have very useful structural and electronic properties for electron emitters.

Zettl further teaches in column 5, lines 44-55 the binder can comprise of a number of compounds and materials, but is silent to the exact composition of the binder.

However, Hsu teaches in column 7 lines 34-43 that an electron emitter of the invention may be modified to include any low work function material, such as alkali metals and their alloys or compounds containing such materials. Hsu further teaches in column 6 lines 12-30, that an additional layer, including oxides, is desirable to form, in order to protect the nanotubes emitters.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct an electron emitter which comprises an electrically conductive material coated with a mixture of nanotubes and oxygen-containing compounds of alkali-earth metals. It would be relatively easy and cost effective to manufacture an electron emitter with an alkali-earth metal oxide deposited on the nanotubes. One would be motivated to carry out this deposition in light of Hsu because it can be seen that this coating will improve the filed emission efficiency while simultaneously protecting the nanotubes.

In regards to claim 14, Zettl in view of Hsu teach all of the recited limitations of claim 12 (above).

Hsu further teaches in column 10 lines 39-64, that the nanotubes have diameters from just a few to up to about tens of nanometers. Hsu further indicates these particular nanotubes have shown improved field emission characteristics.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct an electron emitter according to claim 12 (above), wherein the carbon nanotubes have a diameter in a range from about 1nm to about 200nm.

6. Claims 23-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zettl et al. (USPN 6,057,637) in view of Hsu et al. (USPN 6,333,598) in further view of Lynn (USPN 6,294,867).

In regards to claim 23, Zettl in view of Hsu teach all of the recited limitations of claim 12 (above).

Both Zettl and Hsu are silent to a gas discharge device further comprising a background gas contained within.

However, Lynn teaches in column 4 lines 31-41, that a background gas in the discharge chamber may be argon.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct a gas discharge device according to claim 12 (above) further comprising a background gas being selected from the group consisting of helium, neon, argon, krypton, xenon, and mixtures thereof, since environmental concerns have necessitated the investigation of lamp fill materials other than mercury in order to meet different market demands.

In regards to claim 24, Zettl in view of Hsu teach all of the recited limitations of claim 23 (above).

Both Zettl and Hsu are silent to a gas discharge device further comprising a background gas having a pressure of less than about .3 kPa.

However, Lynn teaches in column 4 lines 31-41, that a background gas in the discharge chamber is within the range of three to 33 torr.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct a gas discharge device according to claim 23 (above) further comprising a background gas with a pressure of 0.3 kPa, since it is well known in the art that 3 torr is equivalent to about 0.3 kPa.

In regards to claim 25, Zettl in view of Hsu teach all of the recited limitations of claim 24 (above).

Both Zettl and Hsu are silent to a gas discharge device further comprising a background gas contained within.

However, Lynn teaches in column 4 lines 31-41, that a background gas in the discharge chamber may further comprise mercury vapor.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct a gas discharge device according to claim 24 (above) further comprising a mercury vapor, since it is well known in the art that mercury vapor is the most important element in a successful low pressure gas discharge device.

Conclusion

7. Claims 7-11 and 18-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The best prior art of record fails to disclose the composition according to claims 7 and 18 wherein the carbon nanotubes are produced by a catalytic cracking and pyrolyzing of hydrocarbons.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Macchiarolo whose telephone number is (703) 305-7198. The examiner can normally be reached on 7.30 - 4:30, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on (703) 305-4939. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

pjm
September 25, 2002

Sandra O'Shea
Supervisory Patent Examiner
Technology Center 2800